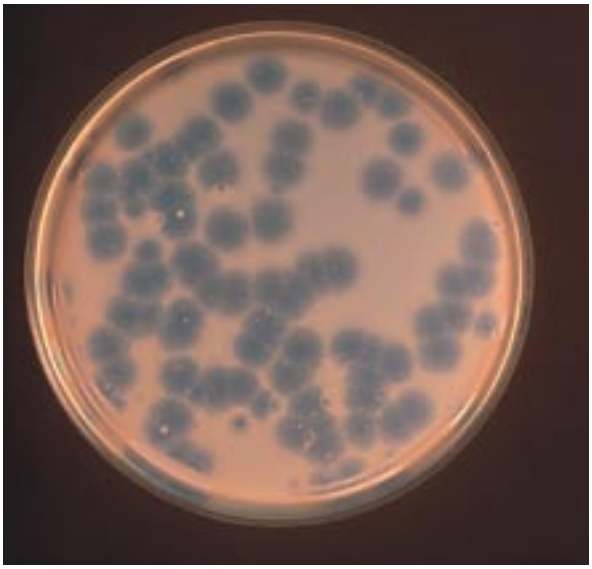
47 Reducing Risk

How do you prevent yourself from catching an infectious disease? You now know that your immune system provides you with natural defenses, but sometimes your immune system becomes overwhelmed by disease-causing microbes and you get sick. One way to reduce your risk of getting sick is by taking simple precautions, like washing your hands before you eat. You may even use antimicrobial solutions, such as an anti-bacterial soap or a disinfectant, when you clean up. How effective are these products at killing germs?

You can measure the effect of different solutions on the growth of microbes. You can culture, or grow, microbes in a special dish known as a **petri** (PEE-tree) **dish**. The petri dish contains food for the organisms you are trying to culture. In classrooms, the most commonly used food is agar, a gelatin-like material that was first invented by Robert Koch. If bacteria are present, many of them will grow on the agar. You can see this in the petri dish in the photograph below. It is also possible for molds and algae to grow on agar.

CHALLENGE

How effective are different solutions at preventing the growth of microbes?



Colonies of bacterial growing in a petri dish

MATERIALS

For the class

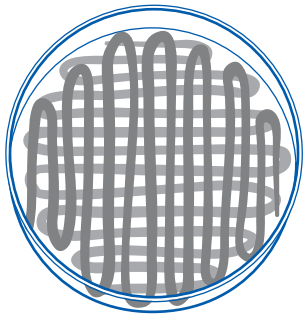
- permanent marker(s)
- tape

For each pair of students

- 1 sterile petri dish containing agar
- 1 sterile cotton swab
- source of bacteria
- solution(s) such as soap, disinfectant, preservative, etc.
- 4–5 paper disks (punched from filter paper or brown paper towel)
- 1 pair of forceps
- 1 pencil
- 1 metric ruler
- paper towel

PROCEDURE

First Streak



Second Streak

1. Use a permanent marker to put your name and class period on the bottom of your petri dish.
2. Dip your swab in the source of bacteria provided by your teacher.
3. Remove the lid of the petri dish. Use the swab to streak the bacteria onto agar as shown in the drawing above left. Press firmly but not too hard. Your goal is to spread the bacteria but not to break up the agar layer. Turn the dish 90˚ and repeat as shown in the drawing below left.
4. Use a pencil to write the initial of the solution you are testing on a disk of filter paper (or brown paper towel).
5. Use your forceps to dip the disk in the solution. To remove excess solution, touch the edge of the disk to a clean paper towel.
6. Place the disk on the agar of your petri dish and re-cover the dish.
7. Repeat Steps 3–6 for each solution you are testing. Be sure to leave at least 1.5 cm between the paper disks. Tape around the dish to seal it.
8. Place your petri dish in a warm place for a few days.

9. Make a data table in your science notebook to record your observations. Be sure to include all of the solutions that you are testing.

10. Check the growth of microbes in the dish each day. Record if the growth of microbes has stopped in the area around the disk. If so, use a ruler to measure this space, known as the zone of inhibition.

11. Examine the control dishes set up by your teacher. Record your observations.

ANALYSIS

1. Share your results with the class.
   a. Did everyone who tested the same solution get the same results? Explain.
   b. How effective were the different solutions in preventing microbial growth?
   c. How might you follow up on this investigation or improve the design of this investigation?

2. Did the solution(s) affect the growth of bacteria on your petri dish? Explain. Be sure to compare your results to the control and to describe your evidence.

3. On a clean sheet of paper prepare a written report summarizing your investigation. Include your name, the date, and a title for your report. Your report should have the following three components:
   a. A statement of the problem you were trying to resolve.
   b. A description of the materials and procedure you used to solve the problem.
   c. An analysis of the results, which should include:
      - a copy of your data table.
      - a summary of the results shown by the data in your data table.
      - an answer to this question: How effective are various solutions in preventing the growth of microbes? (Describe your evidence completely in your answer.)
      - any problems you may have had with the investigation.
      - any additional questions related to the problem that you would like to investigate.

4. **Reflection:** Have the results of your experiment caused you to want to change any of your behavior (such as what solutions you use to wash your hands or household surfaces)? Why or why not?